



MEETING ABSTRACT

Open Access

The effect of foot structure and functional foot stability on the gait patterns of the foot

Malia T Ho*, John Tan

From 4th Congress of the International Foot and Ankle Biomechanics (i-FAB) Community
Busan, Korea. 8-11 April 2014

Background

Poor foot structure, such as flat feet or high arched feet were thought to cause excessive foot movement during gait, which in turn is the pre-cursor to foot injuries [1,3].

However, some studies claimed that the differences in gait patterns may not be due to foot structure alone [4,8,11]. It has been suggested that good foot functional stability can 'protect' the mal-aligned foot from injuries [9].

Functional Foot Stability is defined in this study as 'the ability of the foot to continually adjust its position to maintain the body in an upright, balanced position'. An individual with good functional foot stability will be able to sense the foot position and if necessary, correct the position of the foot, thus preventing potential foot injuries.

Whilst studies have been also done to relate foot structure and functional stability [6], as well as functional stability and gait patterns [12,14], no study has been done to investigate the combined effect of foot structure and functional foot stability on gait patterns. Therefore, this study examines the combined effect of foot structure and functional foot stability on running gait patterns.

Method

Sixty-five subjects (mean age 31 years SD 7.1) had their foot structure scored according to the Foot Posture Index (FPI) [5,10,13] and their functional foot stability was assessed with balance errors scored according to the criteria set out by the Balance Error Scoring System (BESS) [2,7]. Subjects were then put into six groups- Flat foot Stable, Flat foot Unstable, Normal Stable, Normal Unstable, High Arched Stable and High Arch Unstable. The total excursion of the rearfoot, midfoot and first metatarso-phlangeal joints were noted with three

dimensional motion analysis. The results were then analysed using ANOVA.

Results and conclusion

The results showed a significant difference in total excursion of rearfoot inversion/eversion of the flat foot unstable group compared to the other groups.

Published: 8 April 2014

References

1. Tong J, Kong P: Association between foot type and lower extremity injuries: a systematic literature review with meta-analysis. *J. Orthop Sports Phys Ther* 2013, (Epub ahead of print).
2. Bell D, Guskiewicz K, Clark M, Padua D: Systemic review of the Balance Error Scoring System. *Sports Health* 2011, **3**(3):287-295.
3. Burns J, Keenan A, Redmond A: Foot type and overuse injury in triathletes. *Journal of the American Podiatric Medical Association* 2005, **95**(3):235-241.
4. Chuter V: Relationships between foot type and dynamic rearfoot frontal plane motion. *Journal of Foot and Ankle Research* 2010, **3**(9).
5. Cornwall M, McPoil T, Lebec M, Vicenzino B, Wilson J: Reliability of the Modified Foot Posture Index. *J Am Podiatr Med Assoc* 2008, **98**(1):7-13.
6. Cote K, Brunet M, Gansseder B, Shultz S: Effects of pronated and supinated foot postures on static and dynamic postural stability. *Journal of Athl Train* 2005, **40**(1):41-46.
7. Docherty C, Valovich McLeod T, Shultz S: Postural control deficits in participants with functional ankle instability as measured by the balance error scoring system. *Clin J Sport Med* 2006, **16**(3):203-208.
8. Fan Y, Fan Y, Li Z, Li C, Luo D: Natural gaits of the non-pathological flat foot and high arched foot. *PLoS ONE* 2011, **6**(3):e17749. Retrieved from doi:10.1371/journal.pone.0017749.
9. Hunt A, Smith R: Mechanics and control of the flat versus normal foot during the stance phase of walking. *Clinical Biomechanics* 2004, **19**:391-197.
10. Keenan A, Redmond A, Horton M, Conaghan P, Tennant A: The Foot Posture Index: Rasch Analysis of a novel foot specific outcome measure. *Arch Phys Med Rehabil* 2007, **88**:88-83.
11. Levinger P, Murley G, Barton C, Cotchett M, McSweeney S, Menz H: A comparison of foot kinematics in people with normal and flat arched foot using the Oxford Foot Model. *Gait and Posture* 2010, **32**:519-523.

* Correspondence: Maliahotd@gmail.com

Physical Education and Sports Science, Nanyang Technological University,
Singapore 637616, Singapore



12. Liu K, Uygur M, Kaminski T: **Effect of ankle instability on gait reports.** *Athletic Training and Sports Health Care* 2012, **4**.
13. Redmond A, Crane Y, Menz H: **Normative values for the Foot Posture Index.** *Journal of Foot and Ankle Research* 2008.
14. Ridder R, Willems T, Roosen P: **Plantar pressure distribution during gait and running in subjects with chronic ankle instability.** *Journal of Foot and Ankle Research* 2012.

doi:10.1186/1757-1146-7-S1-A36

Cite this article as: Ho and Tan: The effect of foot structure and functional foot stability on the gait patterns of the foot. *Journal of Foot and Ankle Research* 2014 **7**(Suppl 1):A36.

**Submit your next manuscript to BioMed Central
and take full advantage of:**

- Convenient online submission
- Thorough peer review
- No space constraints or color figure charges
- Immediate publication on acceptance
- Inclusion in PubMed, CAS, Scopus and Google Scholar
- Research which is freely available for redistribution

Submit your manuscript at
www.biomedcentral.com/submit

